

## Spacesuit Evaporator-Absorber-Radiator (SEAR)

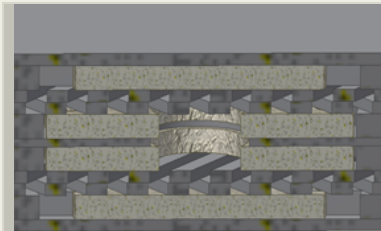
Completed Technology Project (2011 - 2013)



## Project Introduction

The primary goal is to build and test a rigid Lithium Chloride Absorber Radiator (LCAR) coupon based on honeycomb geometry that would be applicable for EVA and spacecraft applications.

This project builds from the work of the first year of effort that successfully integrated the Spacesuit Water Membrane Evaporator (SWME), developed by the JSC Engineering Directorate, and the Lithium Chloride Absorber Radiator (LCAR) developed by Creare Inc. as a flexible, bendable system, into a non-venting system for thermal control. This system could be made more advantageous for spacecraft and Portable Life Support Systems (PLSS), from a mass and volume standpoint, by building the structure of the spacecraft or the PLSS housing with high-strength carbon fiber composite honeycomb, the cells of which would be filled with the chemical absorption media. In this way the multifunctional composite element provides structural strength, desiccant storage and the radiator surface area required for heat rejection. A 2 ft<sup>2</sup> panel will be constructed and tested in thermal and thermal vacuum conditions. A flight-like regeneration system will also be built and tested. A thermal fluid model will be built and correlated to the test data. The entire stack would have a depth of 12 mm, and include the storage stack honeycomb of 8 mm in depth, an internal vapor header, and an external radiator face sheet. In this way, the housing multifunctionally provides the necessary housing protective structure, desiccant storage capacity, and radiator surface to reject the heat. The 8mm depth of storage media suggests more efficient absorption resulting in a potential radiator temperature of 330K. A similar arrangement would be useful in providing a non-venting topping function for orbiting spacecraft during low lunar orbit where both heat rejection requirements and 290 K peak sink temperature are relatively high. Regeneration could be conducted during colder parts of the orbit where there is more available cooling for a condensing heat exchanger.



Laminated Structure

Project Image Spacesuit  
Evaporator-Absorber-Radiator  
(SEAR)

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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission  
Directorate (STMD)

### Lead Center / Facility:

Johnson Space Center (JSC)

### Responsible Program:

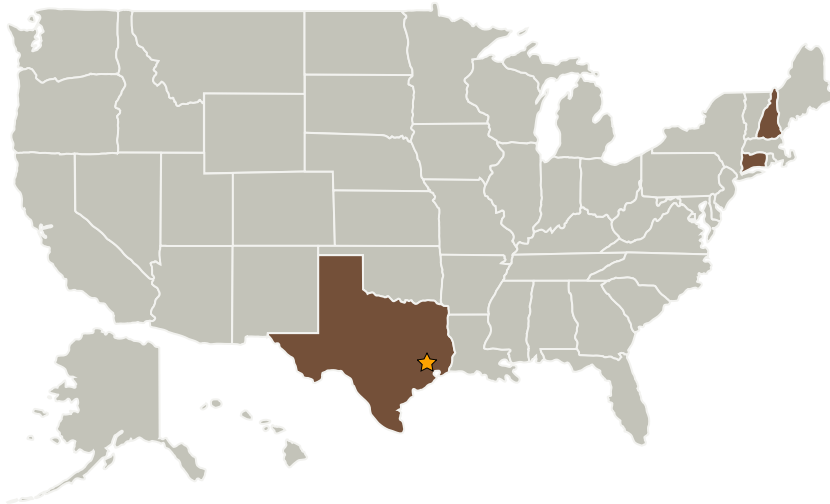
Center Innovation Fund: JSC  
CIF

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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
Creare LLC	Supporting Organization	Industry	Hanover, New Hampshire
United Technologies Aerospace Systems	Supporting Organization	Industry	

Co-Funding Partners	Type	Location
Creare LLC	Industry	Hanover, New Hampshire
United Technologies Aerospace Systems	Industry	

## Project Management

**Program Director:**

Michael R Lapointe

**Program Manager:**

Carlos H Westhelle

**Project Manager:**

Grant C Bue

**Principal Investigator:**

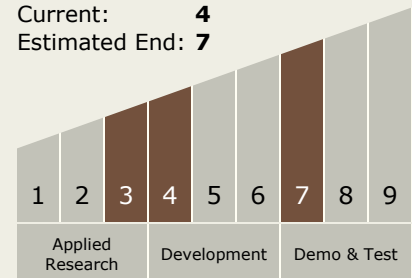
Grant C Bue

## Technology Maturity (TRL)

Start: 3

Current: 4

Estimated End: 7



## Technology Areas

**Primary:**

- TX14 Thermal Management Systems
  - └ TX14.2 Thermal Control Components and Systems
    - └ TX14.2.3 Heat Rejection and Storage

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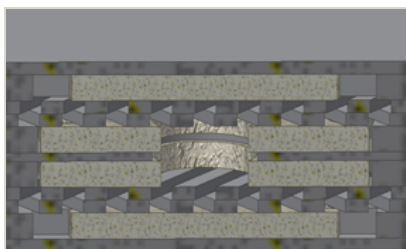
### Primary U.S. Work Locations

Connecticut

New Hampshire

Texas

### Images



Laminated Structure

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Project Image Spacesuit  
Evaporator-Absorber-Radiator  
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(<https://techport.nasa.gov/image/2208>)